# Sample FSU Math Contest Problems

1. Find real numbers a, b, and c such that $2x^2 - 8x + 2012 = a + b(x-2) + c(x-2)^2$
   Indicate your reasoning clearly.

2. Find a three-digit integer in base five that has the order of its digits reversed when multiplied by two. Indicate your reasoning clearly.

3. (a) If a and b are integers, explain why $a+b$ and $a-b$ are either both even or both odd.
   (b) In how many ways can 2012 be represented as the difference of two perfect squares?
      Justify your answer.

4. An equilateral triangle is inscribed in a unit square and shares one vertex with the square. Find the length of the side of the triangle.

5. Find the sum of all positive integers from 1 to 2012 (inclusive) that are not exactly divisible by 4 or 6 (or both).

6. For whole numbers a and b, a rectangle of width a and length b is composed of ab unit squares as in the figure (where $a=8$ and $b=5$). For each of the following two cases, find the number of interiors of unit squares that are intersected by a diagonal of the rectangle of width a and length b.
   (a) $a=101$ and $b=213$
   (b) $a=1010$ and $b=2600$.
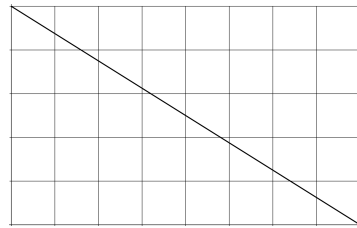
7. Six points on a circle are connected by line segments in all ways possible. If two colors, say red and green, are used to paint the line segments, show there is at least one triangle with all three sides the same color.